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November 30, 2018

Mr. Colin Santee
Director of Parks & Recreation Department
Town of Fairfax
12 Buck Hollow Road
Fairfax VT 05454

Re: Fairfax Community Center - Structural Evaluation

Dear Colin,

At the request of the Friends of the Fairfax Community Center, Inc. (FFCC) and under contract with the Town of Fairfax, Sellers Treybal Structural Engineers (STS) was asked to perform a structural evaluation of the former "Baptist Building" on Main Street in Fairfax, Vermont to determine its suitability for conversion into a community center. This letter report documents the findings of our structural evaluation. It also includes recommendations for structural upgrades and/or repairs. It should be understood that these recommendations are intended for planning and budgeting purposes, and are not sufficiently detailed for construction purposes.

Nature of the Existing Building

The building was built as a church, reportedly completed in 1848 with a small extension added to the back a few years later. It measures approximately 40' wide by 65' long, with an additional 6' wide portico along the front elevation. The Main Level includes the formal entrance from the portico, a vestibule area, and the sanctuary. There is a full lower level with side entrance at grade, and a partial Upper Level (perhaps a former choir loft) along the front of the building. The roof is a simple gable of 6:12 pitch covered with slate, with attic access via a ladder from the Upper Level. A belfry at the front of the building is built-up from the attic level framing. All framing is of wood, with brick exterior walls above the Main Level and stone exterior walls at the Lower Level.

Building History and Proposed New Use

According to information provided by you and the FFCC:

- The building was used as a church from the time of construction until the 1980's, with services held approximately once per month since the 1920's. From the 1980's until 2015 the Masons leased the building, using it periodically. During all this time, the building was heated only when in use and left unheated most of the time.
- Approximately fifteen years ago, upgrades were made to the building including:
    - extensive repairs to slate roofing and flashing

    - complete repointing of the exterior and other masonry repairs
    - installation of a perimeter curtain drain
- The building was donated to the Town of Fairfax in 2016 and began limited use at the Main and Lower levels for meetings and special events such as a haunted house.
- The town and FFCC plan to convert the building into a full-time community center, with public events held at the Main and Lower levels. Planned upgrades include improved heating and insulation to allow full-time use through the winter, window restoration, addition of ADA access to both the Main Level and Lower Level (most likely via an added lift/stair tower at the back of the building), and any needed structural repairs.
- The town and FFCC are particularly interested in any structural upgrades needed to allow Public Occupancy use of the Main Level spaces.

Scope of Structural Evaluation
STS's structural evaluation included the following components:

- A walk-through structural evaluation, conducted by Katherine Hill, PE on 10/13/17. This included visual observations of the nature, layout, and condition of the existing structural systems to the extent that they were readily visible and accessible at the time of the visit. Framing visible during the site visit included all roof framing, the top of the attic framing (rest hidden by insulation between the joists), and about 80% of the Main Level framing, where the ceiling had been removed. The Upper Level framing and interior load-bearing wall studs were not visible.
- Load-rating calculations for typical framing members at roof, attic, and the Main Level, to assess the need for structural upgrades.
- Identification of unsafe structural conditions, structural conditions that need to be upgraded to meet code for the proposed new use, and other conditions where structural improvements are recommended even if not required by code.

It should be understood that portions of the structural systems were hidden behind finishes and that the visual observations made during the site visit not intended to be an exhaustive inspection of all exposed conditions. Thus, there may be hidden structural conditions that were not apparent during the site visit.

General Structural Considerations for the Proposed New Use
The building code requires that when a public building changes use or is altered, the existing structural systems need to checked for compliance with the <u>current</u> building code wherever the loads on the existing structure increase by more than 5% for gravity loads and by more than 10% for lateral loads. Any structural elements not in compliance must be upgraded to meet the current code. Existing structural conditions that fall below these thresholds of increased loading are grandfathered, so long as they do not create an "unsafe" condition.

Building code requirements aside, if structural deficiencies are encountered it is prudent to plan for upgrades even if not technically required by code so as to prevent future repairs, reduce maintenance costs, and allow for better performance of the building.

Overall Impressions
The structural systems of the building include the floor and roof framing, the exterior masonry walls, the curved load-bearing stud wall between the sanctuary and vestibule areas, basement posts, and the footings. Overall, the building has been well-maintained and the structural systems are generally in good repair and performing adequately. Notable exceptions are described in the sections that follow for each portion of the building.

Belfry
There are four levels to the belfry tower: the enclosed belfry roof, the open level where the bells are located, an enclosed space between the floor supporting the bells and the gable roof below, and the belfry posts and supporting sleeper beams that sit on the attic framing. Belfries/steeples are prone to water leaks and resulting deterioration of the timber framing. It can be very expensive to make structural repairs to belfries/steeples, so it is essential to include them in regular maintenance inspections and to address any leaks promptly before they lead to larger problems.

The belfry roof was not accessible during the site visit without a ladder. It is recommended to send someone to look up the hatch to check for any signs of leaks or deteriorated framing.

The open bell level has been enclosed with chicken wire, but there is still an accumulation of bird guano and other debris on the floor. Two of the four corner posts (8"x8") are starting to rot just above floor level where debris has collected around the post. The loss of section is not enough to require repair at this time, but all existing debris should be cleaned away from the posts to prevent continued decay.

The raised wood framing supporting the bells appears to be sound. One of the wood spindles on the wheel that turns the bells has cracked and needs repair.

The wood shingles that cover the sloped floor of the bell level are weathered and there is an active leak at the west corner that has caused deterioration of the diagonal floor beam below. It doesn't appear that structural repairs need to be made at this time, but a more thorough assessment should be made on a subsequent site visit. It is recommended to upgrade the roofing at the floor of the bell level and add flashing to divert water around the corner posts to prevent further deterioration of the belfry framing.

The belfry framing in the attic and the interstitial space appear to be sound, aside from the diagonal beam noted above.

<u>Summary of structural recommendations for the belfry:</u>
- During the current evaluation phase, have someone check the interior of the belfry roof, and have the structural engineer take a second look at the deteriorated diagonal beam at the framing supporting the bells.
- Add an annual inspection of all levels of the belfry to the maintenance list.
- Remove existing debris from the bell level floor, and then add this task to the annual maintenance list.
- Repair damaged bell spindle before using bell.
- Fix roof leak at belfry floor to protect framing below; preferably upgrade the cedar shingle roofing and add flashing around the columns.

Roof Framing

The general layout of the existing roof framing is shown in plan in sketch SK4 and in section in sketch SK5. The roof framing system consists of a series of heavy-timber queen rod trusses that clear span between 12"x12" wood sills on top of the exterior walls, two lines of purlins on each side of the roof (approximately 7"Wx8"D and typically hewn) that span between the trusses, and sawn common rafters (3"x4") that run up-and-down the roof between the purlins. There are signs of prior water staining at the roof framing, but it is reported that there are no current roof leaks.

The proposed conversion of the building to a community center has no impact on the existing roof framing, so there is no code requirement to upgrade the roof framing. Adding attic insulation as proposed can sometimes lower the temperature of the roof surface and increase the weight of snow accumulation on the roof, but that is not the case with this building because it has been left unheated for most of its life. Adding insulation won't make the roof surface any colder than it was before. If anything, introducing full-time heating in the winter may somewhat reduce the actual snow load.

The lines of the roof as viewed from the exterior give some indication of how the roof framing is performing. The eaves lines are straight with no horizontal bowing, which indicates that the tying system at the roof is performing as intended. The ridgeline is reasonably straight, with the only dip of significance between Grids 2 and 3 at the back of the building. The belfry is not tilting backwards, as is often the case when the back of a belfry/steeple bears on a roof truss rather than posts down to the foundations. The plane of the roof surfaces appears "wavy" between ridge and eaves. This is a result of the truss-purlin-rafter configuration and is not necessarily a matter of structural concern. The rafters tend to deflect in between the purlins, causing the slates at the purlin lines to tip up slightly, creating a shadow that is readily visible from the ground. Such deflections are normal; the slate roof just makes it more obvious than other roofing materials. The only structural "red flag" as viewed from the exterior is a pronounced area of rafter and purlin deflection between Grids 2 and 3.

The roof trusses are shown in cross section in sketch SK5. The truss's principle rafters and horizontal top straining beam are sawn 8"x8". The truss bottom chord, located at the attic framing level, is a hewn beam approximately 11"wide by 12" deep. The bottom chord is hung from the intersection of rafter and framing beam with a 3/4" rod at each side. The roof trusses appear to be in excellent condition with no signs of structural distress. In particular, there is no sign of movement or splitting at the critical heel joints where the rafters bear against the top of the top chord. These are joints that are prone to structural failures, particularly if leaking water has accumulated inside the joint. Load rating calculations have not been performed for the roof trusses, as the proposed project will not increase roof loads and the trusses appear to be performing satisfactorily.

The 3"x4" rafters all appeared to be in sound condition with no signs of structural distress, aside from one rafter split at its notched end that is already adequately shored. Load rating calculations show that the rafters are suitably sized for anticipated snow loads.

The purlins are typically hewn timbers about 7" wide and 8" deep. They are notched at the top to accept the rafters. Most of the purlins have a clear span of about 9', except for the purlins between the Grid 2 and 3 trusses, which span 14'. This longer span is the "red flag" area identified from the exterior of the building. The purlins in this bay are replacement sawn purlins, and are somewhat smaller than the typical purlins. On the southwest slope of the roof, the replacement purlins have some punky material and insect damage that was likely present at the time they were installed. None of the purlins show signs of structural distress (cracks, splits, etc) other than the excessive deflections between Grids 2 and 3.

Load rating calculations for the typical 9' purlins show stress levels to be higher than permitted by current code, but still within an acceptable range for grandfathered framing that shows no signs of structural distress. It is recommended to leave these purlins as-is, but to include them the annual maintenance inspection of the building to monitor them for any new signs of distress.

Load rating calculations show the 14' purlins between Grids 2 and 3 to be grossly undersized, which is consistent with the excessive sag. While these purlins are technically grandfathered since roof loads are not being increased, it is recommended to either replace these four purlins with more suitably sized purlins or to reinforce them in place to prevent future problems. Until this can be done, risks can be reduced during periods of unusually high snow loading by "tamping" off the snow in this bay from within the attic space, or by simply not using the back end of the building until the snow slides off the roof.

The purlins have an unusual splice detail where they meet over the top of the trusses. Typically the purlin from one side runs over the top of the truss rafter at a reduced depth, and then the purlins are half-lapped off to the side with an iron U-bar tying the two sides together. The notching at each purlin is excessive by today's codes, but for the most part these connections appear to be performing adequately aside from a couple that have some minor splitting at the notches. Given the generally good performance, it is recommended to leave the sound splices "as-is" but to include them in the annual maintenance inspection to monitor for any new signs of splitting. Alternatively, a steel angle could be lag-bolted to the underside of the purlin to improve the reliability of the connection. The splices with existing splits should be reinforced with structural grade wafer-head screws installed from below.

There is a purlin on the northeast side of the roof between Grids 5 and 6 that was partially replaced immediately downhill of the chimney. The replacement segment is poorly half-lapped to the original purlin on both sides of the chimney, and has also been reduced to half-width to fit around the chimney. The repair is structurally unsound and should be fixed. The best structural option would be to remove this abandoned (?) chimney above attic level and to replace the damaged purlin from truss to truss with a full-width purlin. If the chimney must remain in place, then a new purlin could be added a foot down from the existing purlin but this would require some local reframing of the adjacent rafters. Until such time as this repair is made, the damaged purlin should be added to the annual maintenance inspection to monitor it for signs of change.

It is noted that that there is a short length of snow guards over the side entrance door to the basement. Snow guards prevent snow from sliding off the roof, dramatically increasing the snow loads on the roof. It is not practical to remove the existing snow guard over the door, but it is recommended not to add any additional snow guards or to do anything else that would prevent snow from sliding freely off the roof.

<u>Summary of structural recommendations for the roof framing:</u>

- Replace or reinforce the four grossly undersized roof purlins between Grids 2 and 3. Until such time as this can be done, reduce risk during periods of unusually high snow load accumulation on the roof by "tamping" off the snow in this bay from within the attic space, or by not using the back end of the building until the snow slides off the roof.

- Add the purlins and their unusual splice connections to the annual maintenance list, to monitor for any signs of changes such as splitting or increased deflections.
- Replace or reinforce the poorly repaired purlin at the downhill side of the chimney between Grids 2 and 3.

Attic Level Framing

Attic access is via small hatch reached by a built-in ladder from the Upper Level. The attic is not currently being used for storage. The proposed building upgrades include increasing the level of insulation at the attic, and venting the attic space to the exterior at both gable ends.

While it may be tempting to increase the size of the attic hatch and use the attic for storage, this is not recommended structurally as it would increase the loads on the attic framing and roof trusses, triggering the requirement for both to meet current code. It would also increase the likelihood of cracking the plaster ceiling below. Thus attic access should be limited to just maintenance access.

The general layout of the existing attic level framing is shown in drawings SK-3. The truss bottom chords run from exterior wall to exterior wall. The attic joists span between the truss chords, and are notched into them. The attic joists are typically 2"x6" at 24" on center, except for the longer span between Grids 2 and 3 where the joists are 2"x8". The plaster ceiling of the sanctuary is fastened to the bottom of the joists, there is batt insulation in between most of the joists, and no walking surface on top of the joists.

When viewed from the sanctuary below, the plaster ceiling appears relatively level with some minor hairline cracking of the plaster. The cracking pattern in the plaster ceiling does not indicate any performance problems with the existing attic framing under the existing (non-storage) loading.

The rafters were checked for a 10 psf live load, which corresponds to "maintenance access only" and is not sufficient for attic storage loading. At this maintenance-level live load, the existing joists were found to be adequately sized for bending over the span, but inadequate by code for shear at the ends where the joists are notched into the supporting members. The ceiling joists are typically notched down to 2" high by 2" wide tenons, which pocket into the truss bottom chords.

"Inadequate" shear capacity is a common problem for the notched joists typically found in older wood-framed buildings. Notched joists are prone to splitting horizontally at the notch, so today's building codes place strict limits on the depth of such notches and impose a conservative reduction factor on the shear capacity at the notch. The notched joists found in older buildings almost never meet current code requirements yet many of them have performed adequately, and the more susceptible joists have typically already split by the time the structure has been loaded for 100 years. Thus a more reasoned approach is needed in assessing "inadequate" joist notches in existing buildings.

For the attic space, the recommendation for addressing the notched joists is as follows:

- Do not use the attic for storage, so as not to increase the existing load on the ceiling joists.

- Before increasing the depth of the insulation (and making it harder to see the joists), inspect all of the joist ends for signs of splitting at the notches. Also check the nailing of the joists to the diagonals for any dubious-looking connections.
- At the typical attic joists, reinforce any split notches or dubious connections with added sheet metal angles or toe screws.
- At the longer-span joists between Grids 2 and 3, where the end reactions are higher, reinforce all of the notches with sheet metal angles regardless of whether or not they have split.

If there are any further problems with split notches in the future, there will still be sufficient access through the insulation to fix them if needed.

It is also recommended to add two walkways at the attic space, to make it easier for the annual maintenance checks recommended for the roof framing. These should ideally be at a level above the new insulation, and as close as possible to the eaves as to still allow walking room.

When increasing the insulation depth at the attic, it is recommended to limit the depth at the truss heel joints so that the connection of the principle rafter to the top of the top chord is left exposed to view (and to good ventilation) and ideally visible from the new walkways. The heel joint is the most critical connection in the roof framing and prone to failure, especially if it gets wet. Being able to easily see these joints as part of the annual maintenance inspection will improve the likelihood of catching leaks or deterioration before it proceeds to the point of requiring an expensive structural repair.

Summary of Structural Recommendations for the Attic Framing:

- Do not use the attic for storage.
- Check all existing attic joist end connections before increasing the depth of the insulation. Reinforce any split or dubious connections at the typical joists, and reinforce all notched connections at the longer-span joists between Grids 2 and 3.
- When adding insulation, leave the truss heel joints exposed to view and well ventilated.
- Add walkways for future inspection access.

Upper Level Framing

The upper level framing was not visible to determine the sizes or even the layout of the existing framing. Drawing SK2 shows the presumed layout of the framing, spanning from the exterior wall to the curved interior wall, but this remains unconfirmed.

The architectural finishes above and below the upper level framing show no signs of distress (such as cracking, buckling, crumbling) that would indicate structural distress at the Upper Level joists. The floor is a little bouncy under the "jump test", but nothing out-of-the-ordinary. Based on this assessment, it is reasonable to assume the existing floor framing has been performing adequately for the existing loads. For planning purposes, it would be reasonable to use this space for occupancies with up to a 50 psf live load, which includes offices and classrooms, but precludes public assembly or storage use.

If is desired to use the Upper Level for public assembly or storage, one or more structural probes should be opened so that the size, spacing, and quality of the existing joists can be assessed for higher loading levels.

Summary of Structural Recommendations for the Upper Level Framing:

- Framing is presumed OK for 50 psf live load, appropriate for office or classroom use.
- For higher live load (such as public assembly or storage), probes are needed before the capacity of the existing framing can be verified.

Main Level Framing

The general layout of the existing framing at the Main Level is shown in drawing SK1. There are five interior beam lines that appear to align with the roof trusses above, with wood joists spanning between the beams. The hewn beams are approximately 12" wide by 10" deep and are continuous for the full width of the building, supported on multiple columns below. Column spacing varies from about 7' to a maximum of 29'. The columns on Grids 2, 3, and 4 are turned solid wood columns; these do not appear to be in their original locations as there is a layer of plaster and wood lathe between the column cap and the underside of the wood beam. The posts on Grids 5 and 6 are more recent replacements, 4"x6", some hardwood and some softwood. One turned column is missing at the west end of Grid 4, as the bottom pedestal rotted out to the point where the column loosened and had to be removed.

Sawn wood joists span between the 12"x10" beams at 24" on center. The typical joists are 3"x8" @ 24" on center, while the longer joists between Grids 2 and 3 are 3"x10" at 24" on center. All of the joist ends are notched at the bottom, leaving a depth of 5" where they are pocketed into the supporting beam in a flush-framed configuration. The 3"x10" joists have a square cut at the end notch, while the 3"x8" joists have a scalloped cut at the notch. This scalloped transition is supposed to reduce stress concentrations at the notch and reduce the likelihood of the joist splitting horizontally at the notch. However, a number of the joists - both square cut and scalloped - have horizontal splits at the notch.

The joists are of generally high quality, typically select structural or better, with a few lower quality joists in scattered locations. The joists generally show no sign of structural distress aside from the notch splits noted above. There were a couple scattered joists with more significant splits or local defects that should be sistered while the ceiling is open.

Load-rating calculations have been done for the typical floor joists and all five of the 12"x10" supporting beams, using a dead load of 15 psf and a live load of 100 psf based on the desired public occupancy use. It should be noted that this building was built as a church and functioned as a church for most of its life. Churches generally have fixed seating, which reduces the live load because a tightly packed crowd (the 100 psf public occupancy load) cannot gather around fixed seats. The current building code live load for public occupancy with fixed seating is 60 psf, so changing to a true public occupancy use would increase the design load by more than the 5% grandfather limit. Thus the existing framing needs to meet current code for the 100 psf live load for the proposed public occupancy use.

The typical 3"x8" joists are adequate for 100 psf live load. The longer, 3"x10" joists are modestly overstressed in bending but within acceptable limits for an existing building where all of the joists are visible for inspection, generally show no signs of structural distress, and the one or two lower quality pieces can be sistered. The end notches at the 3"x10" joists, which do not have the taper cut used at the other joists, are inadequate by calculation and several proved the point by splitting. Our recommendation would be to add face-mount joist hangers at all of the 3"x10" joists on account of the square notch cut. Given that several of the 3"x8" joists have split at the notch in spite of the slope cut, we would recommend taking advantage of the current access to reinforce the notches at the 3"x8" joists with 8" wafer head screws driven up from below even though they have adequate shear capacity by code. This will reduce future notch splits.

There are three framed openings down the centerline of the building that have been filled in. Single joists were used on each side of these openings, whereas double joists are needed for the 100psf public occupancy loads. It is recommended to reframe these openings with two new continuous joists in place of the existing opening, as shown in SK-1.

At the back of the building, there is an enclosed basement room below the altar. A stocky timber frame had been added inside this space, for reasons unknown. The floor joists that span to the northeast side of the partition wall are barely fastened to the wall. These connections need to be upgraded, perhaps by adding a ledger to the stud wall and framing the joists to the ledger with joist hangers.

For load-rating the existing 12"x10" beams, we generally assumed select structural grade (on the basis of observed knot size and slope of grain), and downgraded the few span conditions where a lower grade was observed. We also took into consideration the loss of cross section from the 5" deep notches for the floor joists. The load-rating calculations show the existing 12"x10" beams to be significantly undersized for 100 psf public occupancy loading for the current column layout, with some span conditions being unsafe for such loading: the 21-foot clear spans at Grids 2 and 3, and the 29-foot clear span at Grid 4 (where the rotten column was removed). None of the floor beams show signs of structural distress (such as cracking, crushing, or splitting) other than excessive deflection on the three long spans.

We identified these unsafe conditions in an email to you on 10/18/17, where we recommended the immediate installation of temporary shoring posts at the missing column and at the midpoint of these three beams for continued use of the main floor for public occupancy. Permanent columns should be installed at these four locations, which may require new footings for the three posts down the center of the building if probing does not locate existing footings in these areas.

There are other beam span conditions that are sufficiently overloaded at 100 psf live load that we recommend structural upgrades:

- At the east end of the Grid 2 beam, the beam has been cut in half along the diagonal to provide headroom over the stair. We recommend replacing the reduced end of the beam, reinforcing it with laminated veneer lumber (LVL) sisters, or adding a post to reduce the end span.
- At Grids 5 and 6, the existing 13' and 15' spans are too long. On sketch SK1, recommended locations for added posts are indicated. Other post locations are possible, perhaps in combination with adding a beam below the existing beam to improve the span capabilities. As the design progresses, we can work with you to determine an appropriate post/reinforcement scheme that works with the proposed layout of the basement space in this area.

The support of the end of the 12"x10" beams over the window openings was not visible during the site visit, and is potentially questionable given the magnitude of the load and the assumed notching of the beam into the supporting header. It also appears this header may be supporting some of the brick wall above. We recommend taking advantage of the existing demolition work to open up some of these connections to check for signs of distress and to verify that the beams are providing adequate horizontal anchoring of the top of the basement wall, which is leaning (described further below).

Significant plaster cracking was observed at the Main and Mezzanine levels where the curved wall meets the vestibule wall. Standing within the vestibule at the Main Level, the curved wall appears to have settle about 1" with respect to the vestibule wall. There is no sign of any distress at the supporting wood framing when viewed from the basement that would explain this distortion. The basement columns supporting the beam on Grid 5 below are clearly not the original columns. We suspect that the new posts were installed after the beam had sagged due to poor column placement and/or rotting column bases, and that the floor was not jacked back up to the level position when this was done. It appears the vestibule wall did not settle down together with the curved wall (likely because it got "hung up" on the adjacent brick chimney) and remains at its original elevation. This would explain the step distortion pattern in the corner where the walls meet. Such distortion is built in at this point, and is likely not of structural concern. However, since there are also signs of prior roof leaks in the attic around the chimney, we would recommend removing the plaster on upstairs vestibule wall where indicated in SK-2 to check for signs of deterioration at the wood framing inside the wall. This plaster is already in poor condition, with excessive cracking that is likely beyond repair.

The basement floor is a concrete slab-on-grade, except for the utility room at the north corner. The slab appears to be in good condition and the basement was dry at the time of the site visit. Unfortunately the slab was poured around the base of all of the turned wood posts and most of the 4x6 wood posts. Wood post ends absorb water from below and cannot dry when covered with concrete; this situation frequently leads to rot at the bottom of the post and settling of the post (as occurred at the "missing" post) though it may take some years for the post to rot enough to settle. We recommend removing all of the posts that are cast into the slab, grouting the hole in the slab, and resetting the posts on a suitable post base that provides a capillary break to reduce future rotting. The post bases will eventually rot if left as is, so it makes sense to do the repair now, before refinishing the basement.

Given this column resetting needs to be done, it presents an opportunity to relocate posts to more convenient locations - addressing both the beam span problems identified above and the planned use of the space.

<u>Summary of Structural Recommendations for the Basement Level and the Main Level Framing:</u>

- Sister a few joists of sub-standard quality or with excessive notch splitting.
- Reinforce all ends of the longer 3"x10" joists with sheet metal joist hangers.
- Reinforce all end notches of the typical 3"x8" with vertical screws.
- Reframe the three filled-in floor openings at the centerline of the building.
- Resupport the joists that framed to the enclosed room below the altar.
- Add new posts / arrange existing posts to reduce beams spans as noted.
- Reinforce the diagonally-notched beam over stair, or add a new post there to reduce the span.
- Open up a few connections of the floor beams to headers over the window for the engineer to check the nature and condition of these connections.
- Remove cracked plaster as the mezzanine level vestibule to check for rot or other deterioration at the wall framing against the chimney.
- Reset all wood posts that are currently cast into the slab.

Masonry Walls

As noted previously, the exterior walls are brick above the Main Level, and stone masonry at the Lower Level. The masonry is visible from the interior only at the utility room, where it appears that the stone masonry was originally dry laid but has now been mortared at both faces above grade. We understand from the FFCC that the building was fully repointed approximately 15 years ago.

The small areas of stone masonry visible from within the utility room was generally in good condition, aside from some repair work that remains to be completed at the window sill. The bottom few feet of wall has not been fully mortared; there is no structural need to add mortar but it may be desirable to do so for air sealing and vermin control. The exposed walls within the utility room appear plumb with no signs of bowing.

The brick walls are visible only from the exterior and for a small area within the attic. They appear to be in good condition, with mortar in good repair, no cracking of structural concern, generally plumb and with no signs of bowing. There are signs that about half of the back wall of the building has been reconstructed - likely to address settlement cracking - but there has been no further movement or cracking of significance since the repairs were made.

At the south end of the northwest brick wall, there are five steel or iron rods anchored to the outside of the brick wall, three at the corner and two away from the corner. The surface of the brick wall is also warped in this area. It is not clear why the rods were installed, or how far the corner ties extend into the wall. They may have been an initial attempt hold the cracked back wall in position prior to the reconstruction work there. The warping seems to be "built in" at this point and not of structural concern as there as no signs of new cracking.

Some of the corner tie rods may interfere with the proposed door opening at the main level for the ramp and elevator. Some probing will be needed during that construction work to locate the ends of the rods; for planning purpose it should be assumed that new rods will need to be installed above and below the new door opening before the existing rods can be cut.

A small area of the back gable brick wall is visible from within the attic. The brick does not appear to be anchored to the roof or floor framing, though there is no sign of movement from the exterior. This merits some further investigation and perhaps some probing to figure out how the wall is attached. If no wall anchors are found, they should be added to prevent future movements.

The stone walls retain soil for the full height of the basement at the front of the building, and for half of the basement height at the other three walls. There are no hints that the front and back walls are anything but plumb (though largely covered with finishes at the interior). The stone walls on the sides of the building have a noticeable lean with the top of the wall apparently in the correct location and the bottom of the wall pushed into the basement at slab level. The lean is much more pronounced at the northeast stone wall (leaning as much as 4" over the 55" exposed exterior height of the wall) than at the southwest stone wall. We were told the wall has been like this for a long time. One possible explanation is that prior to the installation of the foundation drains and basement slab, the wet soil on the outside of the walls may have heaved inward as it froze, and/or the water caused some soil softening under the outside face of the wall, allowing the wall to pivot at the base. Prior to the installation of the concrete slab, there may not have been enough depth of soil on the inside face of the wall to prevent the bottom of the wall from pushing inward.

While the lean is large enough to be of structural concern (i.e., enough so that the weight of the wall above is creating an outward thrust at the top of the leaning wall), there is no sign of cracking that would indicate there is continued movement. Accordingly, we recommend leaving things as-is and monitoring the walls annually to check for any new movement. Corrective measures (such as buttresses or rebuilding the wall) should be taken if there is any new movement. We also recommend checking the connections of the ends of the Main Level beams to the wall, as noted above, to verify that there is a joint there that can resist tension. If not, some type of tension anchorage should be added.

Summary of Structural Recommendations for the Exterior Masonry Walls:

- Consider mortaring the inside face of the stone walls for the unmortared portion at slab level for purposes of air sealing and vermin control.
- Annually monitor the lean of the existing basement walls at the sides of the building, and take prompt corrective action if there is any sign of progressive cracking or movement.
- Determine whether the back gable brick wall is anchored to the attic and roof framing, and if not add wall anchors.
- Prior to adding new door opening at back wall, locate the ends of the existing tie rods and install new rods if needed prior to removing the existing rods.

Front Columns

There are four fluted columns at the front of the building. These are hollow wooden columns, and one can look down the interior of the column at the east corner from the attic space. There does not appear to be a structural beam running over the tops of the columns. There is a roof truss at the front edge of the building, aligned over the columns, but it does not appear to actually bear on the columns. Instead, it sits on the 12"x12" timber sills of the side walls, which cantilever over the end of the brick side walls to pick up this truss. While this appears to indicate that the wood columns are not intended to be load bearing, it is possible that they are supporting some load and it should not be assumed that they can simply be removed without further investigation or temporary shoring.

The columns appear to be in good structural condition, aside from a small area of the north column, which has a few inches of punky material at the west face where the column bears on the stone. The area of soft wood should be epoxy-patched and repainted to prevent it from absorbing further moisture but the damage does not appear to be significant enough to require structural repair.

We hope this report provides sufficient insight on the condition of the building's structural systems to allow you to plan and budget for your future building modifications. Please do not hesitate to contact us if you have any further questions.

Sincerely,

Katherine E. Hill

Katherine E. Hill, PE
Project Manager

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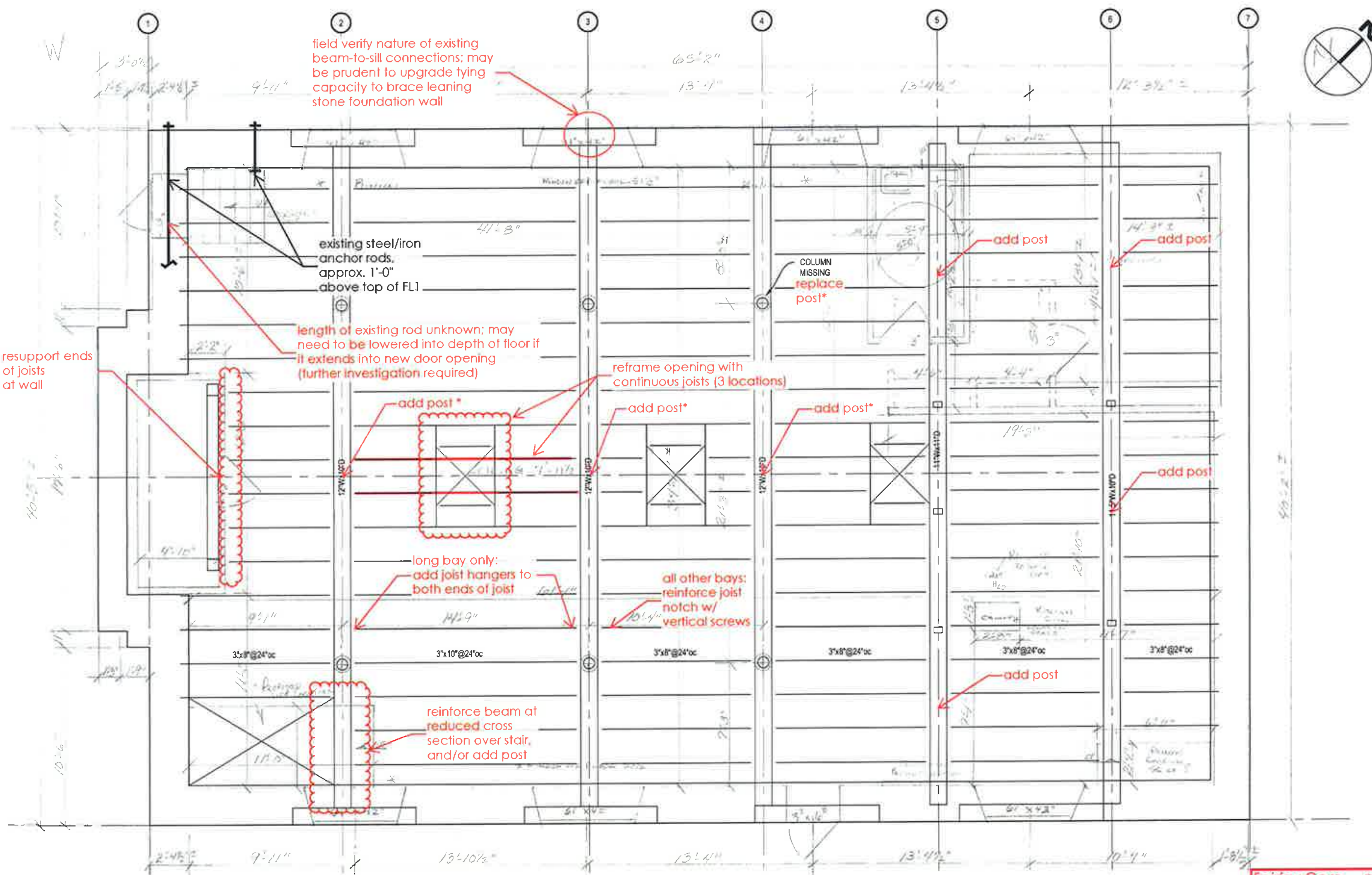

* recommended to add temporary shoring post this location as soon as possible

Main Level Framing Plan

(over Lower Level Background)
3/16" = 1'-0"

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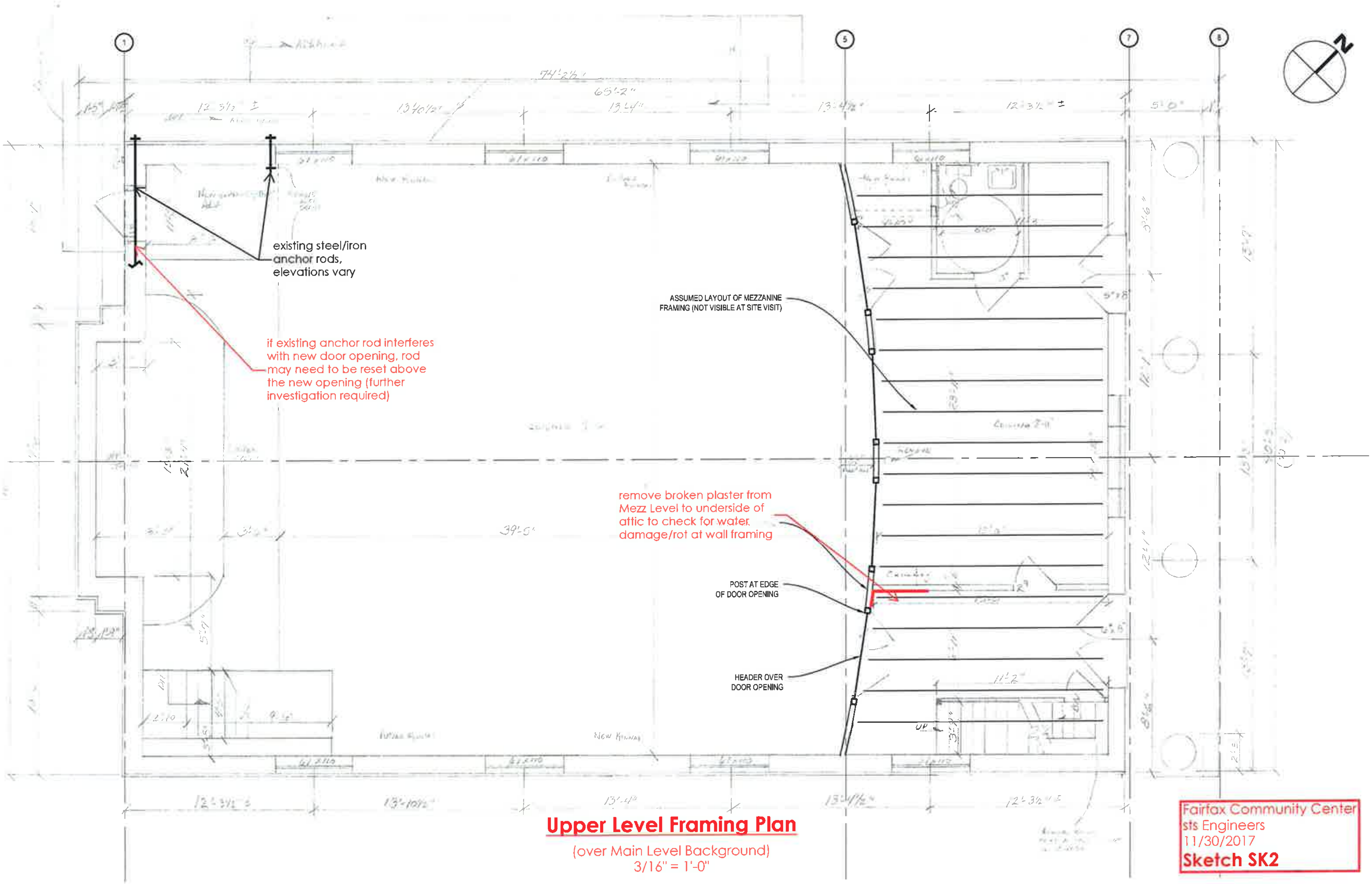
Sketch SK1



Upper Level Framing Plan

(over Main Level Background)
3/16" = 1'-0"

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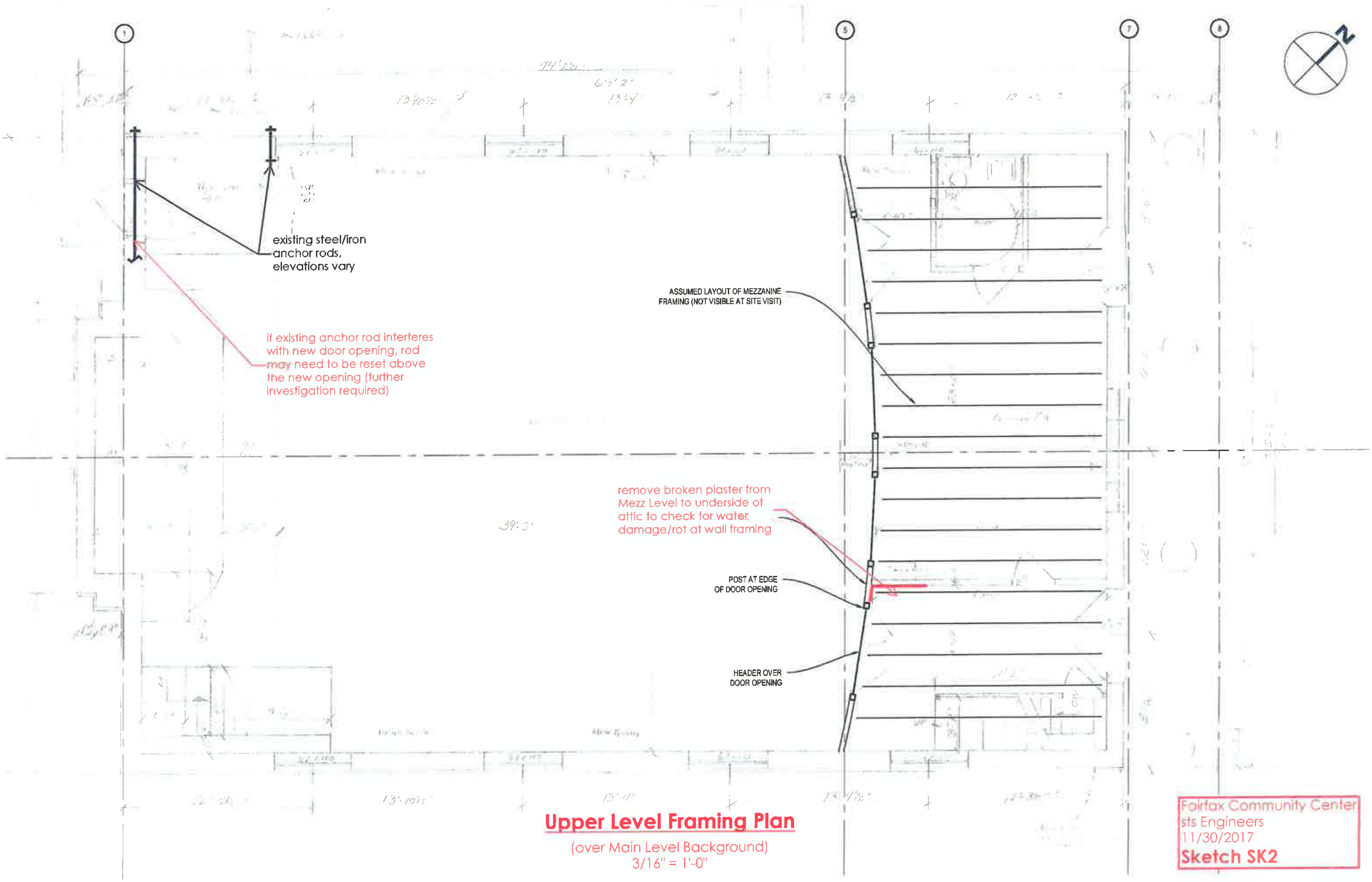
Sketch SK2



Upper Level Framing Plan

(over Main Level Background)
3/16" = 1'-0"

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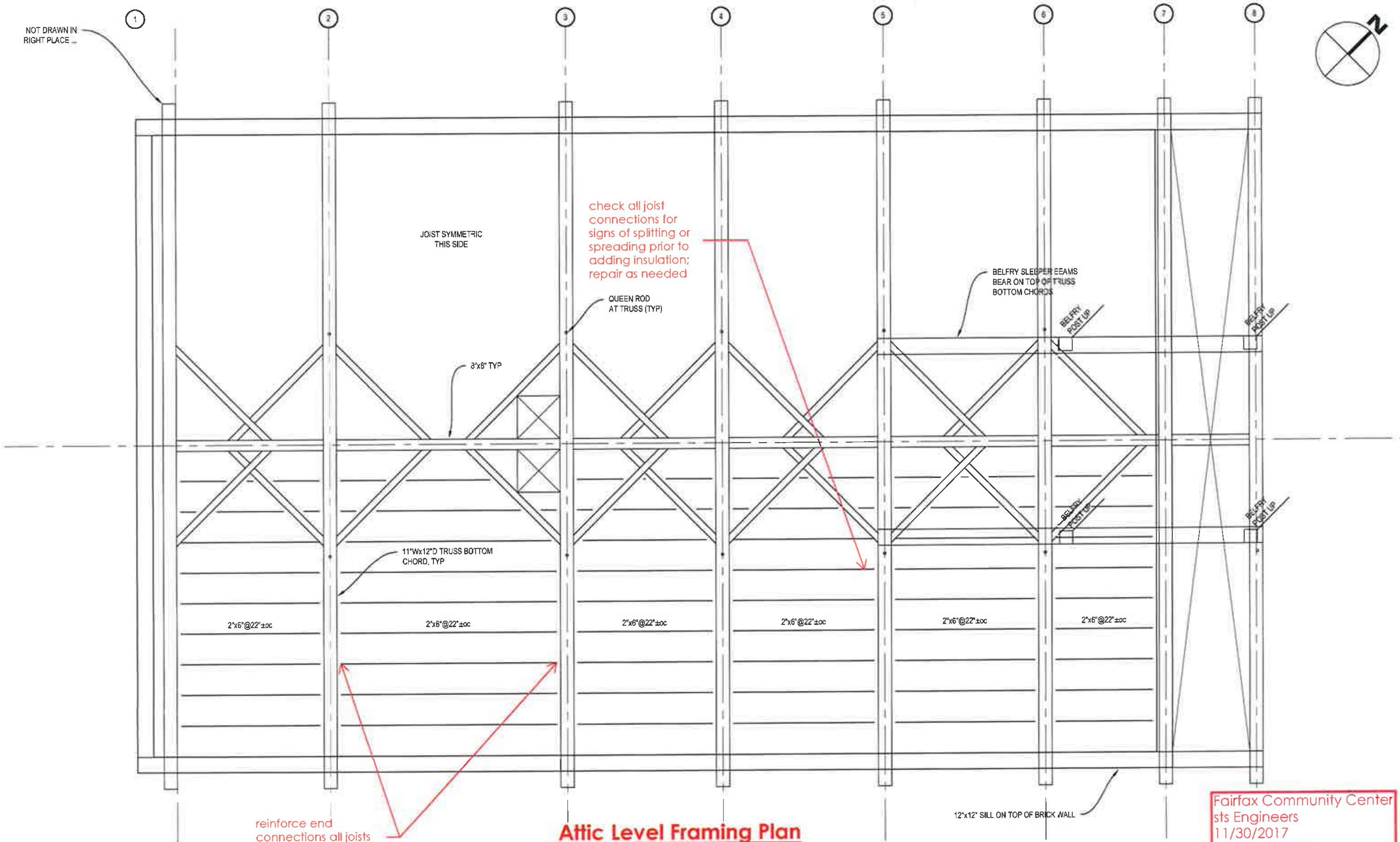
Sketch SK2



Attic Level Framing Plan

3/16" = 1'-0"

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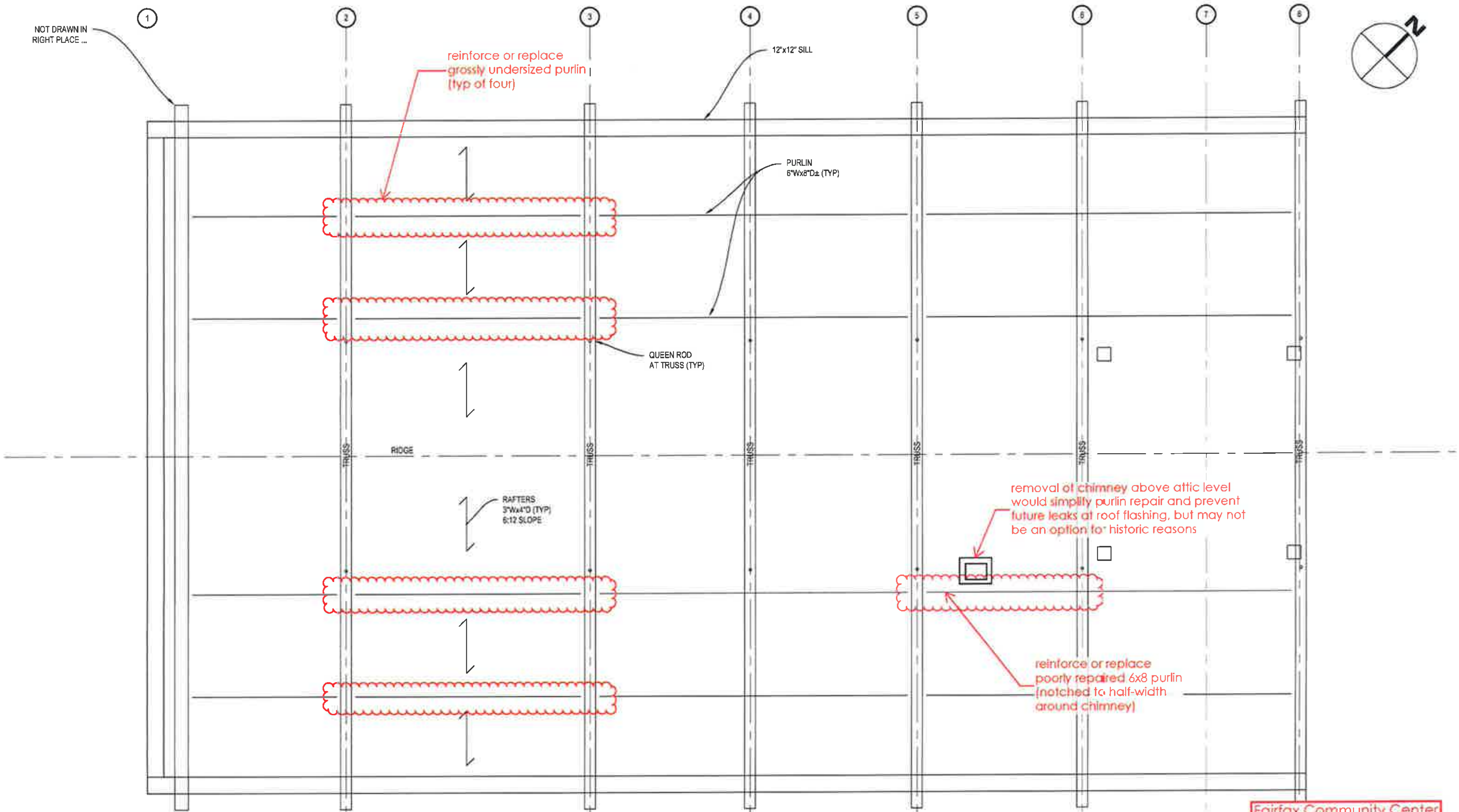
Sketch SK3



Roof Level Framing Plan

3/16" = 1'-0"

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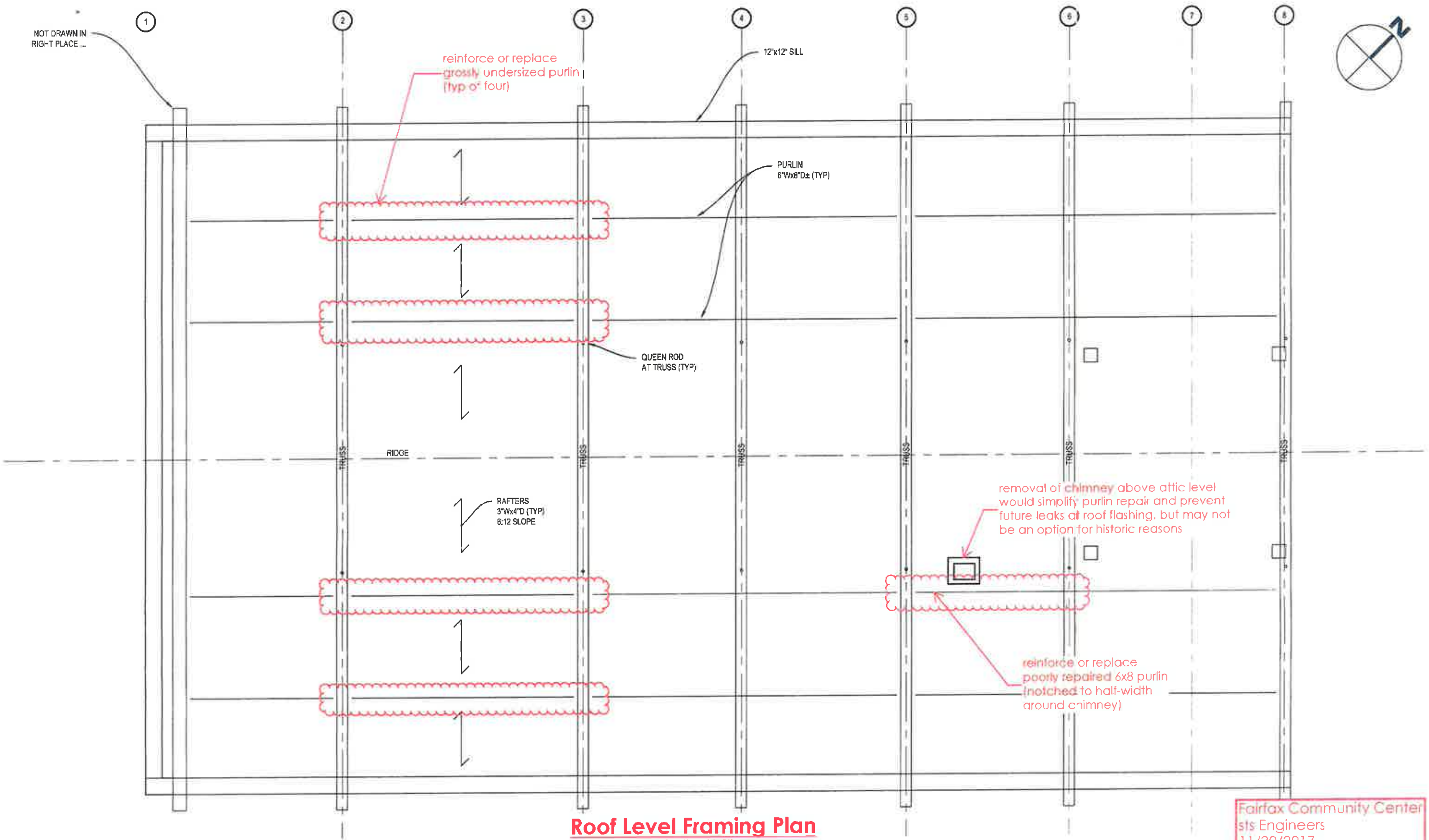
Sketch SK4



Roof Level Framing Plan

3/16" = 1'-0"

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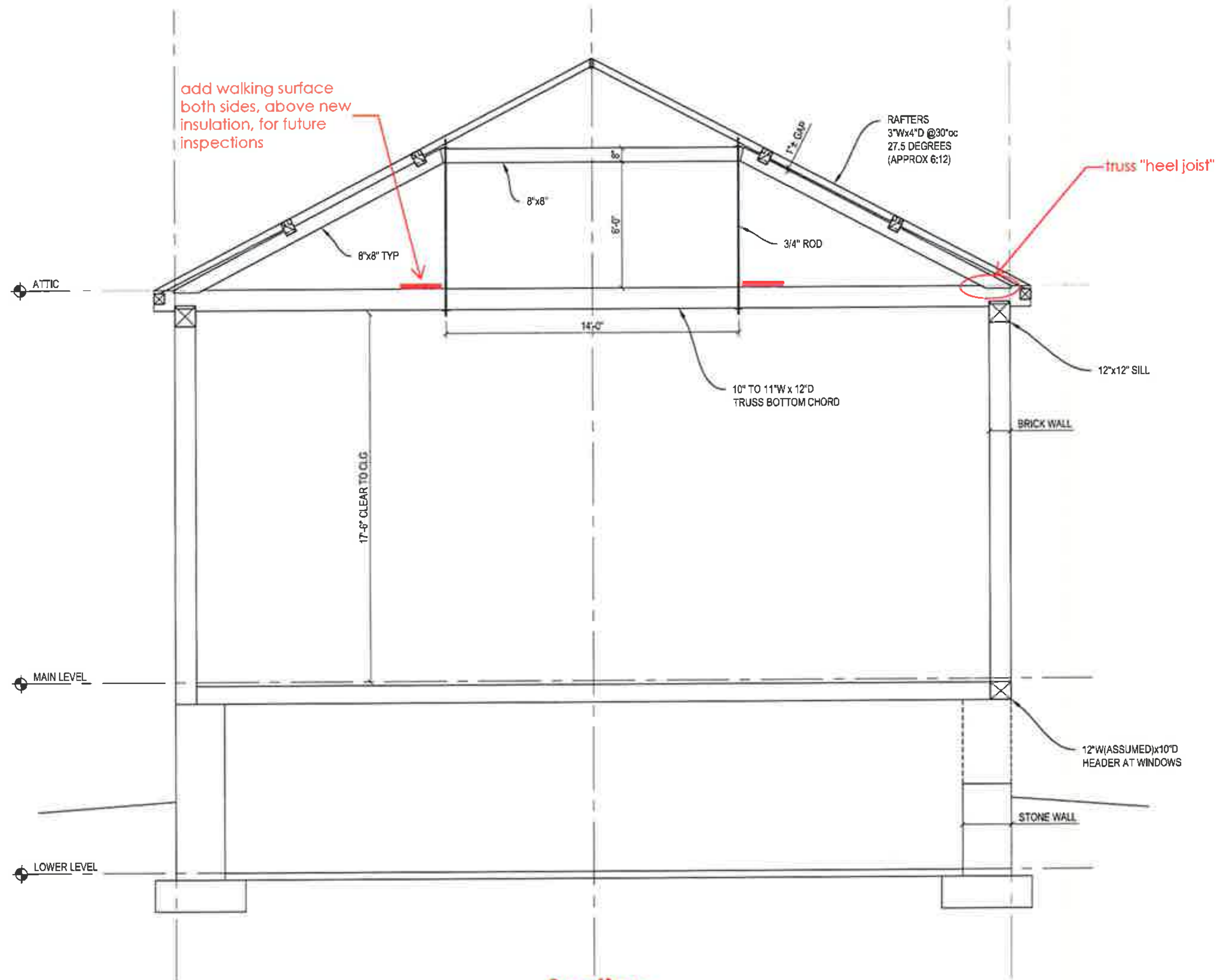
Sketch SK4



Section
3/16" = 1'-0"

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Sketch SK5